EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-11

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	ESDA of Big Data from Stream N

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2a, 2b, 2f, 2g

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 01/15/2016 To 03/15/2016

Comments:
Full Title: ESDA of Big Data from Stream Network Catchments

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2016		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE:
Contractor WP Dated:		
Cumulative Approved:	Cost/Fee	LOE:

Work Assignment Manager Name: Michael McManus (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7994 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 01/13/2016 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

PERFORMANCE WORK STATEMENT

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 3-11

TITLE: Exploratory Spatial Data Analysis of Big Data from Stream Network Catchments
EAS SHORT TITLE: ESDA of Big Data from Stream Network Catchments

PERIOD OF PERFORMANCE: Award date through March 15, 2016

WORK ASSIGNMENT COR (WACOR):

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BACKGROUND:

The EPA needs the ability to assess aggregate watershed effects on water quality over entire watersheds and predict where those effects occur in the stream network. Making these predictions requires compiling stream monitoring data and geographic information systems (GIS) data from other agencies and organizations to increase the number of monitoring sites on the stream network. This increased density of sites means that spatial stream network (SSN) modeling can be used to incorporate spatial similarity among nearby sites to make spatial predictions of water quality (WQ) at unsampled locations. Prior to that modeling, the monitoring and GIS data, such as landscape metrics, need to be incorporated into a common GIS format of the stream network. Such metrics are now available in geospatial datasets, such as the Stream-Catchment (StreamCat) Dataset (Hill, Weber et al. 2016) that can be linked to NHDPlus version

2 (McKay, Bondelid et al. 2012). Exploratory spatial data analysis (ESDA) of such datasets, such as Moran scatterplots (Anselin 1996, Bivand, Pebesma et al. 2008), need to account for two aspects of these data. First, the areal units (i.e, catchments) have a nested structure to them, with catchments nested within USGS hydro-subregions, and hydro-subregions nested within hydroregions. For example, the ~170,000 catchments within the Ohio River Region (region 05), are nested within 14 subregions, such as the Allegheny (0501), Monongahela (0502), Upper Ohio (0503), etc. Nelson and Brewer (2015) recently used ESDA methods on the nested structures of counties, census blocks, and census tracts for public health data. Second, the sheer number of catchments is a challenge to ESDA methods that need to account for the spatial support, which includes the shape, size, and orientation, of the spatial data. For streams, this means, knowing which catchments, based on contiguity, are neighbors to other catchments. One also needs to know which catchments are upstream or downstream of one another (Franklin, Steiner et al. 2002). While agencies such as the USEPA and USGS have made big geospatial datasets readily accessible, what is needed are open-source software tools to do ESDA on these datasets (Steiniger and Hay 2009). Open-source software tools for ESDA of "big" geospatial data would allow the analyses and modeling by USEPA scientists using those data to be transparent and reproducible. To fulfill this mission, NCEA requires the expertise and support as described in the contract Performance Work Statement (PWS).

Support to do ESDA on big geospatial datasets comes from the Pathfinder Innovation Projects (PIP) challenge, which provides USEPA Office of Research and Development (ORD) scientists the time and seed money to try high-risk, high-reward research ideas. The project "Watershed Aggregate Effects and Spatial Predictions on Stream Networks" was a PIP Stage 1 Awardee, with that award meant "…to kick-start low-cost, short-term research projects in new areas, testing new approaches, and potentially bringing game-changing research to EPA." Under this work assignment, support is needed for research to show the feasibility of ESDA on big geospatial data using open-source software This work assignment is intended to serve as a general technical support work assignment with the deliverables from this work assignment to be used in the development of a Stage 2 and Stage 3 PIP proposals.

OBJECTIVES

The first objective of the work assignment is to create a Moran scatter plot based on a matrix of connectivity or adjacency, which is also known as a spatial weights matrix. For areal data, such as for catchments, contiguity is used is to define neighboring catchments. However, because the stream network has a directionality (i.e., upstream to downstream connectivity), a connectivity matrix is also needed to evaluate spatial correlation among catchments based on that directionality.

The second objective is to produce different types of Moran scatter plots. These types included a coded Moran scatter plot and a faceted network Moran scatter plot. The success of this effort will be based on the ability of EPA GIS analysts, ecologists, and spatial statisticians to understand the plots and use the code from open source programs that produced the plots.

QUALITY ASSURANCE

The tasks in this work assignment require the use of secondary data. All QA activities shall be in conformance with EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5)[1] and should demonstrate a clear understanding of the project goals and challenges. The QAPP shall be in conformance with EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5). Portions of this WA relevant to modeling will reference Guidance for Quality Assurance Project Plans for Modeling (EPA QA/G-5M[2]), while portions of this WA relevant to geospatial data will reference Guidance for Quality Assurance Project Plans for Geospatial Data (EPA QA/G-5G[3]). Elements from these sources will be used to derive a single QAPP for this WA. Documentation of all analyses shall also indicate how types, quantity, quality of data have been quality assured and maintained. In particular, the quality assurance report shall also ensure that metadata is compiled in an easy to use format. All products should be detailed so that the decisions and analysis are completely transparent to a third party. The contractor shall alert the COR regarding any quality issues should they arise.

Guidance for developing QAPPs that meet EPA specifications prepared for activities conducted by or funded by EPA is available on online[4]. The project specific quality assurance requirements must be addressed in the work plan and weekly progress reports as specified under Task 1. The QA activities should comprise no more than 10% of the total effort.

SCOPE OF WORK

The purpose of this work assignment is to obtain contractor services to write scripts using open-source tools for exploratory spatial data analysis of large geospatial datasets, such as StreamCat, and NHDPlusV2. The specific tasks are defined below. Technical direction will be provided to the contractor for clarification purposes through written communication provided by the EPA WACOR using technical direction memoranda. Additional background and more details regarding the PWS are provided under the individual task descriptions. Any technical direction (verbal or written) shall be provided to the CL-COR/CO within 3 days.

Task 1: Initiate communication and produce QAAP

SubTask 1.1. Initiate Communication for Regular Reporting

Project meetings and other communications shall continue at regular intervals throughout the period of performance of this Work Assignment.

Task 1.1 Deliverable 1.1.A: Brief, written progress reports as email to the WACOR. Due weekly or upon request by the WACOR for the duration of this WA.

Task 1.1 Deliverable 1.1.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the WACOR for the duration of this WA.

SubTask 1.2. Produce QAPP

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[1] http://www.epa.gov/sites/production/files/2015-07/documents/r5-final.pdf

[2] http://www.epa.gov/sites/production/files/2015-06/documents/g5m-final.pdf

[3] http://www.epa.gov/sites/production/files/2015-06/documents/g5g-final.pdf

[4] http://www.epa.gov/quality/qa_docs.html

All work conducted under this work assignment shall be performed pursuant to an EPA-approved Quality Assurance Project Plan (QAPP). The updated QAPP shall be submitted for review and approval by the WACOR and the EPA QA Officer 14 days after WA award. The QAPP shall be in conformance with EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5). Portions of this WA relevant to modeling will reference Guidance for Quality Assurance Project Plans for Modeling (EPA QA/G-5M), while portions of this WA relevant to geospatial data will reference Guidance for Quality Assurance Project Plans for Geospatial Data (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this WA.

All electronic deliverables (i.e., computer files) shall be submitted in a format acceptable to EPA. Scripts of code written using open source software will be annotated, such as found in an R Markdown format.

The contractor shall not start working on Tasks 2 through 3, until receiving an approved QAPP from the EPA.

Task 1.2 Deliverable 1.2.A: QAPP submitted to the WACOR for review 14 days after WA award.

Task 1.2 Deliverable 1.2.B: A revised QAPP addressing WACOR's and QA officer's comments on the QAPP due one (1) week after receiving comments.

Task 2: Evaluate open source software and produce an initial set of Moran scatter plots

The Contractor shall assess the capability of open source software platforms, including R[5] and Python, to produce Moran scatter plots of catchment variables from StreamCat and NHDPlusV2. Examples of software that should be evaluated include: Spatial Analysis Library[6], GRASS[7]; Quantum GIS[8], and SAGA[9]. The Contractor shall produce Moran scatter plots based on contiguity and upstream-downstream directionality. That hydrologic relationship of upstream-downstream directionality between each stream segment, and their associated catchments, is found in the topological flow tables in NHDPlusV2.

Subtask 2.1 Conference call

The contractor shall participate in a conference call with WACOR to clarify analyses necessary and time table for analyses.

[5] https://cran.r-project.org/web/views/Spatial.html
[6] https://pysal.readthedocs.org/en/latest/
[7] http://grass.osgeo.org
[8] http://qgis.org
[9] http://saga-gis.org

Task 2.1 Deliverable 2.1.A: Conference Call

Subtask 2.2 Produce a table that summarizes the capability of open source GIS desktop software to produce Moran scatter plots based on the criteria described below.

The contractor shall perform technical tasks that identify what open source software is most suited for doing exploratory spatial data analysis (ESDA) on catchment variables. Some criteria to consider for suitability include: ease of importing the geospatial dataset into the software, specifying different types of connectivity matrices, processing time to produce Moran scatter plot, reproducibility by the use of R or Python scripts, and ease of producing publication quality plots.

Completed Analyses By the end of January 2016.

Task 2.2 Deliverable 2.2.A: Annotated script and publication quality plots resulting from that script

Subtask 2.3 Based on the open source software that best met all of the criteria, the contractor shall produce annotated script of Moran scatter plots using the different connectivity matrices. Examples of variables from the StreamCat and NHDPlusV2 datasets evaluated using the Moran scatter plots include percent deciduous forest, 2010 population density, housing unit density in 2010, and road density for the catchments in the Ohio River. The deliverable will be an annotated open source script based on software selected that creates Moran scatter plots based on contiguity and upstream-downstream connectivity matrices.

Completed Analyses By mid-February 2016.

Task 2.3 Deliverable 2.3.A: Annotated script and publication quality plots resulting from that script

Task 3: Produce different types of Moran scatter plots useful for exploratory spatial data analysis of nested areal units such as catchments within subregions. One type is to be a network faceted Moran scatter plot. The other type is a coded Moran scatter plot so that a user can have the size of the symbol plotted be proportional to a third variable, such as catchment size.

Subtask 3.1 Conference call

The contractor shall participate in a conference call with WACOR to clarify analyses necessary and time table for analyses.

Task 3.1 Deliverable 3.1.A: Conference call

Subtask 3.2 Produce annotated script

The contractor shall write an annotated script using open source software to produce a faceted network Moran scatter plot so that the nested structure of catchments within subregions can be explored for spatial autocorrelation in catchment variables. Coded Moran scatter plots for the different types of connectivity matrices will be produced. The deliverables will be annotated script using open source software to produce a coded Moran scatter plot where the symbol size is proportional to the size of the catchment area along with coded Moran scatter plots for the different types of connectivity matrices.

Completed Analyses By mid-February 2016.

Subtask 3.2 Deliverable 3.2.A: Annotated script and publication quality plots resulting from that script

Technical Expertise Required for Key Contractor Staff:

The key technical individual(s) must have experience with geospatial data, geographic information systems, spatial data analysis, and open source statistical/spatial software, as well as significant software coding experience in R and Python

Deliverables and Schedule

Task No.	Subtask No.	Deliverable	Incremental Schedule
1	1.1	1.1.A. Brief written progress reports	Due weekly upon request by the WACOR for the duration of this WA.
1	1.1	1.1.B. Project meetings and other communications, such as conference calls, as needed.	Due upon request by the WACOR for the duration of this WA.
1	1.2	1.2.A. QAPP	Due 14 days after WA award.
1	1.2	1.2.B. Revised QAPP	Due 1 week after WACOR comments
2	2.1	2.1A. Conference call with WACOR	Within 5 business days of receipt of work assignment
2	2.2	2.2.A A table summarizing the capabilities of different open source software to produce Moran scatterplots.	End of January 2016
2	2.3	2.3.A. Produce annotated script using open source software that creates Moran scatterplot of catchments based on different spatial weights matrices	Mid-February 2016
3	3.1	3.1.A Conference call with WACOR	Within 5 business days of receipt of work assignment
3	3.2	3.2.A. Produce annotated script using open source software that creates network faceted Moran scatterplots by subregions and create coded Moran scatterplots.	Mid-February 2016

ACCEPTANCE CRITERIA

The Contractor shall prepare high quality products and that are reproducible and transparent. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as pdf, eps, tiff, or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format. Scripts of open-source code should be annotated, such as in an R Markdown format, that an independent researcher can understand and run the scripts.

TRAVEL

No travel is anticipated for this work assignment.

SPECIAL REPORTING REQUIREMENTS

Following Work Assignment approval, the Contractor WAL shall maintain communication with the EPA WACOR on a biweekly basis through email, telephone, or in writing. The contractor shall contact the work assignment manager by phone with any questions or problems as soon as they arise to ensure rapid resolution. Any technical direction must be documented and a copy sent to the CL-COR and the Contracting Officer.

Written weekly progress reports must be detailed, split into specific tasks to support billings, and document any/all QA/QC procedures performed during the reporting period.

The contractor shall provide the EPA WACOR, either electronically (pdf format) or by fax, any/all documents submitted as deliverables.

Copies of the final report will be submitted in electronic form, with electronic word processing, spreadsheet, statistical and graphics files submitted in software format designated by the EPA WACOR.

CONFLICT OF INTEREST

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

MANAGEMENT CONTROLS

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on the ESDA scripts.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WACOR is authorized to provide technical direction that clarifies the PWS as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the

WACOR within four working days of verbal issuance. This will be forwarded to the CL-COR and CO for their information and necessary actions.

The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the PWS, as well as comments and approval of reports and other deliverables

NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the CL-COR or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

REFERENCES

Anselin, L. (1996). The Moran Scatterplot as an ESDA Tool to Assess Local Instability in Spatial Association. Spatial Analytical Perspectives on GIS. Bristol, PA, Taylor & Francis. **GISDATA 4:** 111-123.

Bivand, R. S., E. J. Pebesma and V. Gómez-Rubio (2008). Applied spatial data analysis with R. New York, Springer.

Franklin, D., J. Steiner, M. Cabrera and E. Usery (2002). "Distribution of inorganic nitrogen and phosphorus concentrations in stream flow of two Southern Piedmont watersheds." Journal of environmental quality **31**(6): 1910-1917.

Hill, R. A., M. W. Weber, S. G. Leibowitz, A. R. Olsen and D. J. Thornbrugh (2016). "The Stream-Catchment (StreamCat) Dataset: A database o f watershed metrics for the conterminous USA." Journal of the American Water Resources Association **In Press**.

McKay, L., T. Bondelid, A. Rea, C. Johnston, R. Moore and T. Dewald (2012). NHDPlus Version 2: User Guide. Herdon, VA.

Nelson, J. K. and C. A. Brewer (2015). "Evaluating data stability in aggregation structures across spatial scales: revisiting the modifiable areal unit problem." Cartography and Geographic Information Science: 1-16.

Steiniger, S. and G. J. Hay (2009). "Free and open source geographic information tools for landscape ecology." Ecological Informatics **4**(4): 183-195.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-11

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	ESDA of Big Data from Stream N

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2a, 2b, 2f, 2g

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 01/15/2016 To 03/15/2016

Comments:
Full Title: ESDA of Big Data from Stream Network Catchments

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 09/30/2012 To 09/29/2016	$0.00	0
This Action:	$0.00	0
Total:	$19,982.00	201

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 01/19/2016	$0.00	0
Cumulative Approved:	$19,982.00	201

Work Assignment Manager Name: Michael McManus (Signature) (Date)		Branch/Mail Code: Phone Number: 513-569-7994 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)		Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley Mark E Cray (Signature)	02/02/16 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-12

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Computing Downstream Use Prote

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	Res Tech Support, Paragraphs a, c, g, j

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 08/01/2016

Comments:
Full Title: Computing Downstream Use Protection Criteria

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
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5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2016		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Diane Yates (Signature) (Date)	Branch/Mail Code: Phone Number: 850-934-9325 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 01/05/16 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

PERFORMANCE WORK STATEMENT

Tetra Tech, Inc.
Contract EP-C-12-060 (Option Period 3)
Work Assignment No. 3-12

TITLE: Methods for Computing Downstream Use Protection Criteria for Lakes and Reservoirs
EAS Short Title: Computing Downstream Use Protection Criteria

PERIOD OF PERFORMANCE: Award date through August 1, 2016

WORK ASSIGNMENT COR:

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INTRODUCTION

Excess loading of N and P is among the most prevalent cause of water quality impairment in the United States, affecting 6,950 surface water bodies for nutrients and 6,511 surface water bodies for organic enrichment/ oxygen depletion (2010 CWA Sec. 303(d) List). Excess N and P in aquatic systems comes from many point and nonpoint sources, including urban and suburban stormwater runoff, municipal and industrial waste water discharges, fertilizer use, livestock production, atmospheric deposition resulting from fossil fuel combustion and ammonia emissions from industrial scale agriculture, and legacy groundwater nutrient pollution. Land use alterations in watersheds across the nation increase the fraction of the N and P applied to the landscape that reaches surface and groundwater resources, impacting aquatic life uses, human health and economic prosperity.

One immediate need that will support the long-term goal of optimal and sustainable nutrient management stems from an emerging view that existing narrative nutrient criteria are inadequate to protect the Nation's waters from possible impacts resulting from nutrient enrichment. Scientifically sound methodologies are needed for translating narrative nutrient criteria to

develop quantitative and enforceable numeric nutrient criteria. Nowhere is this need more apparent than for the Nation's freshwaters, which are bound closely within watersheds directly to the anthropogenic factors that lead to nutrient impairments. Unfortunately, there are thousands of lakes and reservoirs and even more stream reaches draining into these receiving waters, making the task of developing numeric criteria waterbody-by-waterbody truly enormous. In the past, EPA has addressed the large number of waterbodies using a classification and reference condition approach, developing criteria by ecoregion and waterbody type. Another possible approach to managing nutrient enrichment in freshwater systems rests on re-casting the problem as one involving not thousands of separate water bodies (lakes and reservoirs, stream reaches, etc.), but a relatively smaller (but still large) number of watersheds. Within watersheds, receiving waters are focal points for nutrient effects resulting from nutrients transported in stream and river networks. Nutrient concentrations in lakes - and resulting water quality - reflect nutrient concentrations in the contributing rivers and streams, as modified by lake processes. Consequently, nutrient management in lakes could be improved by improving our ability to describe nutrient sensitive aquatic life uses in lakes and possible relationships to nutrient inputs and resulting water quality. Subsequently, management of nutrients in streams and rivers that discharge into lakes may linked to the requirements for protecting downstream lakes. A similar approach could be used to inform management of nutrients in streams and rivers that flow into downstream estuaries and coastal waters, but is not the focus of this project.

EPA has recently received a completed analysis of nutrient-sensitive aquatic life use endpoints that could be used to develop numeric nutrient criteria for natural lakes in the upper midwestern US and reservoirs in the southeastern US (Paul et al. 2014). Subsequent work assignment (EP-C-12-060, WA01-12, WA02-12) built on that research to develop relationships between nutrient loading and concentration and identified aquatic life use endpoints for lakes and reservoirs. The research also evaluated previous approaches and developed and tested new approaches for computing numeric criteria for streams within the watershed of targeted lakes or reservoirs that, if met, would provide an expectation of attainment of water quality goals in the receiving lake or reservoir (Paul et al. 2015). This work assignment encompasses a continuation and completion of that work, with the key objective being effective communication of the results obtained to EPA and the larger scientific community.

OBJECTIVES

The objectives of this project will be communicate the results of the research completed under EP-C-12-060, WA01-12 and WA02-12, as described in the final report completed under WA 02-12 (Paul et al. 2015). Communication will be via a briefing, conducted via webinar, to interested participants in ORD and OW, and via completion of a manuscript, suitable for submission to a scientific journal.

The work assignment is structured into 4 tasks, with tasks 1 and 4 involving management functions only. **Task 1** involves any modification or update of the workplan and QAPP from WA02-12, as needed. As this work is a continuation of a previous assignment, this task is afforded 2 weeks and is expected to require minimal effort. **Task 2** involves preparing for and presenting a webinar. **Task 3** involves writing of a scientific manuscript based on the results of

WA02-12. After Task 1 is complete, task 2 and 3 can be pursued concurrently. **Task 4** addresses progress reviews and final deliverables.

SPECIFIC TASKS:

Task 1. Revise/Update as necessary the Work Plan and QAPP from WA02-12.

The contractor shall develop a work plan briefly addressing the objectives of this work assignment and submit it to EPA for review and approval. EPA will review the work plan within 5 business days of receiving it and either will return it to the contractor with inquiries about the work plan or will approve.

The contractor shall make any necessary modifications to the Quality Assurance Project Plan (QAPP) developed for WA 1-12 and WA02-12 addressing any changes or additions necessary to address all work outlined in the work plan and submit it to EPA for review and approval by the WACOR and the EPA QA Officer. The QAPP shall be in conformance with EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5). As this work assignment reflects a continuation of work under Work Assignment 2-12, the QAPP should be created as an addendum to the approved QAPP for work assignment 2-12, **reflecting only changes as necessary**. EPA will review and approve the QAPP addendum within two (2) weeks after receiving it.

Task 1 Deliverable (1a): Submit a workplan to EPA for approval. Due 14 days after Work Assignment award date.

Task 1 Deliverable (1b): Submit a QAPP reflecting updates, if any, to EPA for approval. Due 5 days after final approval of work plan.

Task 2. Present Findings to ORD and OW audience via Webinar.

The Contractor shall prepare a briefing, to be delivered via webinar addressing the contents and possible significance of the research reported in the Final Report from WA 02-12. The briefing should focus on the most promising or interesting results, based on consultation with EPA, rather than being completely comprehensive in scope.

Task 2 Deliverable (2a). Identify a mutually agreed upon date for webinar. Due 4 weeks before the webinar is scheduled.

Task 2 Deliverable (2b). Prepare webinar slides to be used during the briefing and submit to EPA. Due 2 weeks before the webinar is scheduled.

Task 2 Deliverable (2c) Conduct the briefing on the mutually agreed-upon date prior to January 29, 2016. Due January 29, 2015.

Task 3. Prepare a manuscript in a style and format suitable for publication in a peer-reviewed scientific journal, addressing the most significant findings completed under Work

Assignment 02-12 as and reported under the work assignment. Submit the article and, as time a resources permit, address revisions required by the journal.

In consultation with the EPA WACOR, the contractor shall identify the most significant findings resulting from research conducted under the work assignment and prepare a manuscript addressing the findings and their significance. The manuscript shall be prepared in a style and format suitable for publication in a peer-reviewed scientific journal. The manuscript may draw directly as is useful and appropriate from the Final Report submitted under WA 02-12.

Task 3 Deliverable (3a). Complete draft manuscript and submit to a scientific journal Due April 1, 2016.

Task 3 Deliverable (3b). [optional] As resources permit, address revisions required by the journal and resubmit as requested. Provide a copy of any revisions completed under the WA to EPA. May be implemented as needed through the end of period-of-performance of the WA.

Task 4. Progress Reviews and Monthly Reports

The purpose of this task is to monitor progress on the tasks outlined in the work assignment. Work under this task shall include a monthly call including minimally the TetraTech technical point of contact, EPA's work assignment COR, and technical point of contact to discuss progress and any issues or concerns. This call may be cancelled or rescheduled upon mutual agreement between TetraTech and the WACOR. The workplan shall include mutually agreed-upon tentative dates for all progress reviews.

REFERENCES:

Paul, M., J. Butcher, D. Allen, L. Zheng, and T. Zi (2015). Methods for Computing Downstrewam Use Protection Criteria for Lakes and Reservoirs. Prepared for US Environmental Protection Agency by Tetra Tech, Inc, Research Triangle Park, NC and Tetra Tech, Inc, Center for Ecological Sciences, Research Triangle Park, NC.: 144 pp.

Paul, M., A. Herlihy, D. Bressler, L. Zheng and A. Roseberry-Lincoln (2014). Methodologies for Development of Numeric Nutrient Criteria for Freshwaters. Prepared by Tetra Tech, Inc., Research Triangle Park, NC and Tetra Tech, Inc, Center for Ecological Science, Research Triangle Park, NC.: 345 pp. (includes Appendices 1-25)

CONFLICT OF INTEREST:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

MANAGEMENT CONTROLS:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on the subsequent module outlines, module drafts, and conceptual models for each of the candidate causes.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WACOR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WACOR within four working days of verbal issuance. This will be forwarded to the CL-COR and CO for their information and necessary actions.

   The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

   Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the PWS, as well as comments and approval of reports and other deliverables

NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the

following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the CL-COR and the Contract Specialist or Contract Officer.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-12

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Computing Downstream Use Prote

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	Res Tech Support, Paragraphs a, c, g, j

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 08/01/2016

Comments:
Full Title: Computing Downstream Use Protection Criteria

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 09/30/2012 To 09/29/2016	$0.00	0
This Action:	$28,976.00	271
Total:	$28,976.00	271

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 01/21/2016	$28,976.00	271
Cumulative Approved:	$28,976.00	271

Work Assignment Manager Name: Diane Yates (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	850-934-9325
	FAX Number:	
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	513-569-7920
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Mark Cranley (Signature) 02/23/16 (Date)	Branch/Mail Code:	CPOD
	Phone Number:	513-487-2351
	FAX Number:	513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Climate Change & Urban Stormwa

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2E

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 09/29/2016

Comments:
Full Title: Climate Change & Urban Stormwater Design Guide

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2016		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Susan Julius (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8619 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/25/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-07-068
Work Assignment No. 3-13

I. Title: Climate Change and Urban Stormwater Design Guide

II. Period of Performance: September 30, 2015 through September 29, 2016 (Contract OY-3)

III. Work Assignment COR:
Susan Julius
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8619 (phone)
703-347-8694 (fax)
Julius.susan@epa.gov

Alternate WACOR:
Britta Bierwagen, PhD
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8613
bierwagen.britta@epa.gov

IV. Introduction:
The EPA Office of Research and Development Global Change Research Program (GCRP) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCRP Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

During the last century, much of the U.S. experienced climate change including warming temperatures, increases in precipitation, and increases in the intensity of precipitation events. On top of these large scale shifts are regional and local changes in land use and land cover from urbanization that can also greatly impact urban watersheds. These can interact to yield complex responses on urban water quantity and quality through pulse events, drying/wetting processes, as well as urban practices related to green-spaces (e.g. what is planted and how is it managed).

The potential effects of climate change on watershed hydrology are increasingly well documented. Climate change will have dramatic impacts on water resources, altering precipitation in terms of the amount, timing, and type (e.g. rain versus snow). Increasing air temperature will increase evapotranspiration and possibly net primary productivity in many ecosystems, further affecting water balances locally and regionally. Much less is known about how local and meso-scale decisions in urban and urbanizing areas will interact with these biophysical phenomena to impact water resources. Together, these drivers will lead to numerous cascading effects on water quality, aquatic habitat, and water supply.

The primary method to control urban stormwater is the use of best management practices (BMPs) Traditional grey stormwater infrastructure generally uses single-purpose, hard structures including detention basins and storm sewers to dispose of rainwater. Green infrastructure uses vegetation and soil to manage rainwater where it falls. Green Infrastructure (GI) provides many ecosystem services to city dwellers, including reduced heat loads for human health and reduced energy demand, stormwater infiltration and retention, carbon and nitrogen sequestration, and habitat for biodiversity. Municipalities are getting more and more interested in integrating GI into their traditional "grey" infrastructure because of (1) co-benefits provided that grey infrastructure cannot provide, (2) cost savings, and (3) the flexibility that green infrastructure provides versus grey.

This Work Assignment is for developing a design guide for green and grey stormwater controls that identifies regionally relevant factors that affect urban stormwater control efficiencies given the interaction of climate driven changes (e.g., temperature, precipitation, extreme events) with other changes (e.g., land use change), and methods for adjusting or changing designs to maintain efficiencies. Key objectives of this effort are to (1) review the scientific and grey literature to identify key variables that affect green and grey infrastructure performance, including climate variability and change, and how those key variables change across the country using a relevant categorization scheme, (2) where possible, develop response curves for identified key variables and storm size, (3) develop an urban stormwater vulnerability and design guide that brings together information on key variables, response curves (or thresholds) and climate change to inform modeling and design of urban stormwater BMPs, and (4) prepare written and/or web products for publication.

Potential data sources include case studies and papers that have (1) applied Robust Decision Making to climate change and water quality issues, such as GCRP's case studies on the Patuxent and Illinois rivers, (2) applied the SUSTAIN, RHESSys, BMP-DSS, HydroCAD, SWMM or other relevant models to look explicitly at climate change or to look at other sensitivities in BMP responses due to changes in land use, flow or volume, seasonal variability, or that look at how BMP effectiveness or design changes across a set of locations.

V. Specific Tasks and Deliverables:

Task 1 – Establish Communication, Prepare Workplan, and Prepare QAPP

SubTask 1.1. Establish communication with the WACOR and develop a regular reporting schedule Within 3 days of start date of this work assignment and over the course of 30 days, the Contractor shall schedule a series of weekly conference calls (not to exceed 1 hour) or at the frequency requested by the

WACOR, with the WACOR and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks.

In collaboration with the WACOR, the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.1.A: Brief, written progress reports as email to the WACOR. Due monthly or upon request by the WACOR for the duration of this Work Assignment.

Deliverable 1.1.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the WACOR for the duration of this Work Assignment.

Subtask 1.2 Prepare Work Plan and Staffing Plan; revise approved Quality Assurance Project Plan (QAPP), if necessary

The Contractor shall have 20 days to prepare a Technical Work Plan describing how the work outlined in this Performance Work Statement will be performed, including deliverables, a schedule, budget, and level of effort. The Contractor shall also prepare a Staffing Plan, which shall be submitted as part of the Work Plan that shows assigned personnel by task and the qualifications of the proposed personnel. The Contractor shall provide expertise in the basic science areas required to complete this work assignment.

The Contractor shall make changes to the currently approved QAPP from the last option period 2, if necessary, and submit it to the WACOR and Quality Assurance Manager for approval. If anything has changed or been added to this Work Assignment related to the use of secondary data from Option Period I to Option Period II, the Contractor must address those changes in the QAPP (e.g., how they are going to consider the use of secondary data to carry out this task). Secondary data are defined as environmental or health data that were developed for a different purpose. This includes data used from citations found in the literature. See these documents: "*EPA Manual C/0 2105-P-01-0: EPA Quality Manual for Environmental Programs*"; "*EPA Requirements for Quality Assurance Project Plans (QA/R-5)*"; and "Appendix A. *Guidance on Quality Assurance Project Plans for Secondary Research Data*."

If there are revisions required to the QAPP, they shall submit the revised QAPP in 30 days. Otherwise, a copy of the original QAPP will be submitted with the work plan and cost proposal. The Contractor shall not perform any work on subsequent tasks under this Work Assignment until the Work Plan and QAPP are reviewed and approved.

Deliverable 1.2.A: A workplan submitted to the WACOR for review. Due 20 days after receipt of the work assignment.

Deliverable 1.2.B: If necessary, revised QAPP submitted to the WACOR for review. Due 30 days after receipt of work assignment.

Deliverable 1.2.C: If necessary, a final QAPP addressing COR comments on the draft submitted to the WACOR for approval. Due 1 week after receiving WACOR comments on the draft QAPP.

Task 2 – Complete sensitivity analysis of the effect of precipitation changes on conventional and GI stormwater controls and future adaptations of those controls for Minneapolis and Harford CO, MD
The Contractor shall finalize the modeling and analyses of climate change impacts on the original sites from WA 1-13 and added sites from WA 2-13 to examine (1) responses of BMPs by event size and other variables; (2) thresholds in BMP performance, where possible; (3) BMP design alterations or changes that maintain urban stormwater runoff targets based on response curves or thresholds; and (4) tradeoffs and benefits (GI vs. grey infrastructure strategies) including innovative uses of stormwater, to understand implications of choices beyond differences in removal efficiencies (e.g., urban agriculture). The Contractor shall refine the evaluation of economic costs of alternative stormwater strategies by providing more detailed life cycle (design/build/O&M) costs of options associated with model scenarios for comparison. This shall be used in the cost / tradeoff analysis of grey and green infrastructure for adaptation.

Additional analyses under this work assignment are the following:

(1) For the Minneapolis Conventional site scenario, the Contractor shall perform future adaption to stormwater controls to meet existing conditions by adding distributed GI elements to the site (as opposed to resizing the current practices).
(2) For all of the Minneapolis and Harford County sites, the Contractor shall apply graduated precipitation and temperature changes to the historic records for each site. The graduated set of precipitation changes shall be percent changes that occur only within the largest 30% (defined by total storm volume) of the storms present in the precipitation record. The percent change factors will likely be -10% (a decrease in intensity), +10%, and +20% (both increases in intensity). Air temperature (and PET, which is calculated from air temperature and precipitation) should be adjusted also using the Clausius-Clapeyron relation. This includes both versions of future adaption to meet existing conditions (resizing practices versus adding distributed GI) for each of the Conventional site-based scenarios. (See table 1 below that illustrates the new analyses.) Analyses of model runs shall include comparisons of performance, sizing, and cost.
(3) In consultation with the WACOR, the Contractor shall prepare presentations for the interim and final results, participate in 2 meetings with OW and SSWR to present results, and modify analyses as needed after the first meeting in response to OW and SSWR comments.

Table 1

Location	Site-based scenario	Future Adaptation	Intensity Graduations
Minneapolis	Conventional	Resize practices	-10, +10, +20
	Conventional	Add distributed GI to site	-10, +10, +20
	GI with gray infrastructure	Resize practices	-10, +10, +20
	GI only	Resize practices	-10, +10, +20
Harford Co, MD	Conventional	Resize practices	-10, +10, +20
	Conventional	Add distributed GI to site	-10, +10, +20
	GI with gray infrastructure	Resize practices	-10, +10, +20

Finally, the Contractor shall synthesize the methods, results, and gaps in knowledge from all of the previous analyses completed for this work assignment and shall compile that into an article suitable for publication in a peer-reviewed journal.

Deliverable 2.A. Draft memo with preliminary results for all sites, including additional sites and climate scenarios. Due 16 weeks from workplan approval.

Deliverable 2.B. Prepare presentations on preliminary and final results and hold meetings with OW and SSWR after each presentation is completed. First presentations due 2 weeks after delivery of 2.A and second presentation due 2 weeks after producing final results; meetings held within 4 weeks of producing the interim and final results.

Deliverable 2.C. Final memo with revisions incorporating comments from WACOR, OW, and SSWR. Due 2 weeks after final meeting is held with OW and SSWR.

Deliverable 2.D. Draft article for internal review describing modeling methods and results, including scenarios, response curves, design modifications, and tradeoffs/benefits. Due 8 weeks after Deliverable 2.C.

Deliverable 2.E. Final article for journal submission describing modeling methods and results, including scenarios, response curves, design modifications, and tradeoffs/benefits and responses to internal review comments. Due 4 weeks after receiving internal review comments from the WACOR.

Task 3 – Complete development of structure for stormwater vulnerability and planning (design) guide
Based on consultations with the WACOR and relevant EPA Program and Regional offices, the Contractor shall complete a structure for the stormwater vulnerability and planning (design) guide that incorporates information from Tasks 2 and WA 2-13. The structure should address the significance and treatment of key variables for both modeling and design of stormwater BMPs. The guide shall accommodate variations in degree of knowledge, transferability, and generalizability across and within the classification system chosen. In other words, the structure needs to be flexible to accommodate variations in information across municipalities, climate change, and geomorphology.

The Contractor shall explore the specific format of the guide, e.g., completely web-based vs. downloadable guidebook, or some combination thereof. The Contractor shall include considerations about the ease of updating the guide with new information.

Deliverable 3.A: Meeting (half-day, in person) with WACOR and relevant EPA stakeholders to develop draft proposal for guide structure and format. Due within 2 weeks of WACOR's acceptance of Deliverable 2.C.

Deliverable 3.B: Draft structure and format of guide based on Deliverable 3.A. Due 2 weeks after Deliverable 3.A.

Deliverable 3.C: Tele- or web-conference with WACOR and relevant EPA stakeholders to review and comment on Deliverable 3.B. Due within 2 weeks of receiving comments from WACOR on Deliverable 3.B.

Deliverable 3.D: Final structure and format of guide based on Deliverable 3.C. Due 2 weeks after Deliverable 3.C.

Task 4 – Develop content based on structure and format in Task 3

The Contractor shall develop the content based on Tasks 2 and 3 and populate the structure using the format agreed upon in Task 3. Deliverables under this task shall be presented to the WACOR and relevant EPA stakeholders (as in Task 3) and revised as necessary before sending the content for internal and external review. The Contractor shall respond to internal and external review of document, provide revised copies, and support limited additional analysis in response to comments or requests for additional detail.

Deliverable 4.A: Draft guide based on final structure of Deliverable 3.D. Due 6 weeks after Deliverable 3.D. Revised guide due 2 weeks after receiving WACOR's comments on draft.

Deliverable 4.B: Meeting (in person or tele- or web-conference) with WACOR and relevant EPA stakeholders to review Deliverable 4.A. Due within 2 weeks of submitting Deliverable 4.A.

Deliverable 4.C: Internal review draft of guide based on comments received under Deliverable 4.B. Due 2 weeks after Deliverable 4.B.

Deliverable 4.D: Revised guide for external review and document of responses to internal review comments. Due 4 weeks after receipt of internal review comments from WACOR.

Deliverable 4.E: Revised guide for final publication and document of responses to external review comments. Due 4 weeks after receipt of external review comments from WACOR.

Task 5: Produce trade journal article on Guide

The contractor shall find a suitable trade publication with professional audience(s) engaged in all components of stormwater management to facilitate communication about the guide and promote its availability and use online.

Deliverable 5.A. Draft trade journal article. Due 2 weeks after Deliverable 4.E.

Deliverable 5.B. Final trade journal article for submission. Due 2 weeks after receiving internal review comments from the WACOR.

Task 6: Conduct literature review and modeling of BMP effectiveness under conditions of poor soils and climate changes

The Contractor shall conduct a literature review of the performance of stormwater BMPs under conditions of poor soils, and under the combination of poor soils and climate change. Using those results, the Contractor shall propose several sites with poor soils and recommend an analysis design that may include the following (1) responses of BMPs by event size and other variables; (2) thresholds in BMP

performance, where possible; (3) BMP design alterations or changes that maintain urban stormwater runoff targets based on response curves or thresholds; and (4) tradeoffs and benefits (GI vs. grey infrastructure strategies) including innovative uses of stormwater, to understand implications of choices beyond differences in removal efficiencies (e.g., urban agriculture). The Contractor shall modify the analysis design based on comments from the WACOR and several selected experts in poor soils and BMP performance. Once the analysis design is finalized, the Contractor shall conduct the modeling and evaluate the results. The Contractor shall summarize in a memo to the WACOR results of the literature review and the modeling methods and results for the selected sites. In consultation with the WACOR, the Contractor shall prepare a presentation for the final results and participate in a meeting with OW and SSWR to present results. The Contractor shall include the results in the design guide under Task 4.

Deliverable 6.A. Memo summarizing results of literature review. Due 4 weeks after Deliverable 2.E.

Deliverable 6.B. Site selection proposal and draft analysis design. Due 2 weeks after Deliverable 6.A. Final site selection and analysis design incorporating comments from WACOR and other selected experts. Due 2 weeks after receiving compiled comments from the WACOR.

Deliverable 6.C. Draft memo summarizing modeling results. Due 4 weeks after Deliverable 6.B.

Deliverable 6.D. Presentation and meeting with OW and SSWR. Due 4 weeks after Deliverable 6.C. Final memo incorporating comments received at the meeting. Due 4 weeks after the meeting with OW and SSWR is held.

Task 7: Assess water quality standard attainment at the watershed scale for one region under alternative climate change scenarios

This task will build on existing information on BMP effectiveness under changing climate conditions in order to develop information in the form of a catalog, guide, or other accessible on-line format to help planners and managers select appropriate and resilient management strategies for attaining water quality standards and implementing water quality attainment plans.

The Contractor shall conduct a literature review of existing site-specific studies of several different types of BMPs and their performance under current conditions and under future climate change scenarios. The review will also include studies that link BMP effectiveness with uncertainty information and watershed-scale approaches that enable attainment of water quality standards as climate changes. Based on data availability and results of the literature review, the Contractor shall recommend alternative pilot regions and types of water quality standards/TMDLs, (e.g., nutrients), and climate change stressors to focus analysis on for the first phase of this work. The selection of a single pilot region, management target, and climate change stressor will be done in coordination with OW (i.e., Office of Wetlands, Oceans, and Watersheds/Assessment and Watershed Protection Division and Nonpoint Source Control Branch). The Contractor shall conduct a meta-analysis of BMP study results applicable to the selected region, management target, and climate stressor. After examining various statistical methods for extrapolating results to larger watershed scales, the Contractor shall apply the selected statistical method to draw conclusions about the performance of pilot study BMPs at larger watershed scales. The Contractor shall explicitly consider and characterize climate change-related uncertainties and their implications for BMP performance results and attainment of the selected water

quality goal. The Contractor shall provide a draft summary of results in a "climate smart" BMP catalogue or other format that will be online/web-enabled for OW partners at the regional, state, and local level to use in planning and decision making. The Contractor shall meet with the WACOR and OW (and potentially SSWR) to present results and proposed format to receive feedback from OW and their partners. The Contractor shall deliver a revised summary and format based on comments received from OW and partners.

Deliverable 7.A. Memo summarizing results of literature review. Due 4 weeks after Deliverable 5.B.

Deliverable 7.B. Memo proposing pilot region and phase 1 scope. Due 2 weeks after Deliverable 7.A.

Deliverable 7.C. Final pilot region and phase 1 scope, incorporating comments from OW and the WAM. Due 1 week after receiving comments.

Deliverable 7.D. Draft summary of results and proposed format. Due 4 weeks after Deliverable 7.C.

Deliverable 7.E. Meeting with OW and partners. Due 4 weeks after Deliverable 7.D.

Deliverable 7.F. Final memo incorporating comments received at the meeting. Due 4 weeks after the meeting with OW and partners is held.

VI. Schedule of Milestones and Deliverables:

Task No.	DELIVERABLE	Schedule
1	1.1.A. Progress reports	Due monthly
	1.1.B. Other communication	Due upon request by the WACOR
	1.2.A. workplan	Due 20 days after receipt of WA
	1.2.B. Draft QAPP	Due 1 week after receiving WACOR comments
	1.2.C. Final QAPP	Due 30 days after receipt of WA
		Due 1 week after receiving WACOR comments
2	2.A. Draft memo of results	Due 16 weeks after workplan approval
	2.B. 2 Presentations; 2 meetings with OW and SSWR	Due 2 weeks after Deliverable 2.A. (1st presentation) and 2 weeks after producing final results (2nd presentation); Due 4 weeks after 1st presentation is delivered (1st meeting) and 4 weeks after the 2nd presentation is delivered (2nd meeting)
	2.C. Final memo	Due 6 weeks after Deliverables under 2.B.
	2.D. Draft journal article	Due 8 weeks after Deliverable 2.C.
	2.E. Final journal article for submission to journal	Due 4 weeks after receiving internal review comments
3	3.A. Half-day Meeting on guide structure and format	Due 2 weeks after Deliverable 2.E.
	3.B. Draft structure and format for Guide	Due 2 weeks after Deliverable 3.A.
	3.C. Tele-/web-conference	Due 2 weeks after receiving WACOR comments on 3.B.
	3.D. Final structure and format for Guide	Due 2 weeks after Deliverable 3.C.
4	4.A. Draft Guide	Due 6 weeks after Deliverable 3.D.
	4.B. Meeting	Due 2 weeks after Deliverable 4.A.
	4.C. Internal review draft Guide	Due 2 weeks after Deliverable 4.B.
	4.D. External review draft Guide	Due 4 weeks after receipt of internal review comments
	4.E. Final Guide	Due 4 weeks after receipt of external review comments
5	5.A. Draft trade journal article	Due 2 weeks after Deliverable 4.E.
	5.B. Final trade journal article	Due 2 weeks after receiving internal review comments.
6	6.A. Literature review summary	Due 4 weeks after Deliverable 2.E.
	6.B. Proposed sites and draft analysis plan; Final site selection and analysis plan	Due 2weeks after Deliverable 6.A.; Due 2 weeks after receiving compiled comments from the WACOR
	6.C. Draft memo summarizing modeling results	Due 4 weeks after Deliverable 6.B.
	6.D. Presentation and meeting with OW and SSWR; Final memo.	Due 4 weeks after Deliverable 6.C.; Due 4 weeks after meeting with OW and SSWR

7	7.A. Literature review summary	Due 4 weeks after Deliverable 5.B.
	7.B. Memo proposing pilot region and phase 1 scope	Due 2 weeks after Deliverable 7.A.
	7.C. Final pilot region and phase 1 scope	Due 1 week after receiving comments from WAM and OW.
	7.D. Draft summary of results and proposed format	Due 4 weeks after Deliverable 7.C.
	7.E. Meeting with OW and partners	Due 4 weeks after Deliverable 7.D.
	7.F. Final memo and format	Due 4 weeks after the meeting with OW and partners is held.

VII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

VIII. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

IX. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on subsequent deliverables.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this

contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WACOR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WACOR within four working days of verbal issuance. This will be forwarded to the CL-COR and CO for their information and necessary actions.

   The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

   Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the PWS, as well as comments and approval of reports and other deliverables

X. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the CL-COR and the Contract Specialist or Contract Officer.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Climate Change & Urban Stormwa

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2E

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 09/29/2016

Comments:
Full Title: Climate Change & Urban Stormwater Design Guide

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2016	$0.00	0
This Action:	$127,361.00	1,226
Total:	$127,361.00	1,226

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 10/15/2015	Cost/Fee: $127,361.00	LOE: 1,226
Cumulative Approved:	Cost/Fee: $127,361.00	LOE: 1,226

Work Assignment Manager Name: Susan Julius (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8619 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 10/27/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Phase 3 Climate Change Urban G

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e, 2i

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 09/29/2016

Comments:
Full Title: Phase 3 Climate Change Urban Green Infrastructure

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 09/30/2012 To 09/29/2016 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Thomas Johnson (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	703-347-8618
	FAX Number:	
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	513-569-7920
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Mark Cranley (Signature) 09/25/15 (Date)	Branch/Mail Code:	CPOD
	Phone Number:	513-487-2351
	FAX Number:	513-487-2109

Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 3-14

I. Title: Phase 3 Modeling and Analysis of Climate Change Effects on Urban Green Infrastructure Performance

EAS Short Title: Phase 3 Climate change Urban Green Infrastructure

II. Period of Performance: Award through Sept 29, 2016 (Contract OY-3)

III. COR:
Thomas Johnson, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8618 (phone)
703-347-8694 (fax)
johnson.thomas@epa.gov

Alternate COR:
Christopher Clark, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8665
clark.christopher@epa.gov

III. Introduction:

The EPA Office of Research and Development (ORD) Global Change Assessment Staff (GCAS) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCAS Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

Climate change could significantly alter the occurrence and management of urban stormwater runoff quantity and quality. Responding to this challenge requires and improved understanding of potential changes together with the effectiveness of management responses for reducing impacts under range of potential future climatic conditions. The primary method to control urban stormwater is the use of best management practices (BMPs). Traditional grey stormwater infrastructure generally uses single-purpose, hard structures including detention basins and storm sewers to dispose of rainwater. Green infrastructure

(GI) uses vegetation and soil to manage rainwater where it falls. GI provides many additional ecosystem services, including reduced heat loads for human health and reduced energy demand, carbon and nitrogen sequestration, and habitat for biodiversity. GI also provides many potential benefits for adapting to climate change, but uncertainty remains due to limited understanding of GI performance in different hydroclimatic and urban settings, and in response to changes in climate.

Previous work under this Contract (WA 2-14) resulted in the completion of simulation modeling with RHESSys to assess the performance of urban GI in different urban archetypal settings (AUS's) under current and future climatic conditions. Previous work also has resulted in a draft manuscript submitted to the COR describing the results of RHESSys simulations of climate change effects on GI performance in different hydroclimatic and urban archetypal settings.

This Work Assignment is for continuing support during Option Year 3 to complete and submit for publication in peer reviewed journals 2 manuscripts: the current draft manuscript describing RHESSys simulation results, and a second manuscript describing how RHESSys simulation results can be applied to existing U.S. cities.

IV. Specific Tasks and Deliverables – Option Year 3:

Task 1 – Prepare Workplan, Establish Communication, and Prepare QAPP

SubTask 1.1. Prepare Work Plan and Cost Estimate

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment.

SubTask 1.2. Establish communication with the COR and develop a regular reporting schedule

The Contractor shall contact the COR and schedule a kickoff project meeting. In collaboration with the COR the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.2.A: Brief, written progress reports as email to the COR. Due monthly or upon request by the COR for the duration of this Work Assignment.

Deliverable 1.2.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the COR for the duration of this Work Assignment.

SubTask 1.3. Develop a QAPP

All work conducted under this Work Assignment shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP). The contractor shall develop a Quality Assurance Project Plan within 30 days after project start for review and approval by the COR and the EPA QA Officer. The QAPP can be based directly on the previously approved QAPP developed for WA 1-14 and continued for WA2-14 in Option Year 2 titled "Literature Review and Modeling to Assess the Sensitivity of Green Infrastructure Performance to Climate Change in Urban Systems". The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and

written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Work Assignment relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Work Assignment relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Work Assignment. The Contractor shall not perform any work under this work assignment until the above documents are reviewed and approved by the COR and Quality Assurance Manager (QAM).

Deliverable 1.3.A: QAPP for this WA. Due to the COR 2 weeks after award.

Task 2. Complete Manuscript for Publication in a Peer Reviewed Journal on RHESSys Simulations of Climate Change Effects on GI

Previous work under this Contract (WA 2-14) resulted in a draft manuscript describing the results of RHESSys simulations of climate change effects on GI performance in different hydroclimatic and urban archetypal settings. This draft manuscript will undergo internal peer review by EPA staff managed by the COR. Upon completion the COR will provide internal peer review comments on the draft manuscript to the Contractor.

The Contractor shall revise the existing, draft manuscript to respond to internal peer review comments. The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall submit the revised, final draft manuscript to the COR for review. Upon approval by the COR, the Contractor shall submit the final draft manuscript to the selected journal for peer review and (if accepted) publication.

Deliverable 2.A: A revised, final draft manuscript discussing the effects of climate change on GI performance submitted to the selected journal for publication. Due 4 weeks after receiving internal peer review comments from the COR on the existing, draft manuscript.

Task 3. Conduct Analysis and Prepare Manuscript for Submittal and Publication in a Peer Reviewed Journal on Mapping Archetype Results to Selected U.S. Cities

Previous work under this Contract (WA 2-14) resulted in analysis and development of an approach for mapping archetype simulation results to real U.S. cities. Mapping results to real cities is attractive as it provides a way to translate findings of this study to real world situations and potentially inform planning efforts by local governments.

In consultation with the COR, the Contractor shall implement the proposed approach for mapping existing RHESSys simulation results for urban archetypal units to selected U.S. cities. The Contractor shall subsequently complete a written manuscript describing the results of mapping for submittal to a peer reviewed journal for publication (approximately 20-30 single-spaced pages excluding figures/tables). The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall prepare a first draft manuscript and submit to the COR for internal peer review by EPA staff. Upon completion the COR will provide internal peer review comments to the Contractor. The Contractor shall then revise the draft manuscript to address internal peer review comments and upon

approval by the COR submit a revised, final draft manuscript to the journal for peer review and (if accepted) publication.

Deliverable 3.A: A draft manuscript on mapping archetype simulation results to selected U.S. cities submitted to the COR for internal peer review. Due 8 weeks after approval of Deliverable 2.A.

Deliverable 3.B: A revised, final draft manuscript on mapping archetype simulation results to selected U.S. cities submitted to the selected journal for publication. Due 4 weeks after receiving COR comments on Deliverable 3.A.

Task 4. Provide electronic files of all model setup, input and simulation output

The Contractor shall provide to the COR electronic copies of all model setup, model input, and simulation output files generated in this project on a memory stick or external hard drive. Files shall be organized in a directory structure approved by the COR.

Deliverable 4.A. Electronic copies of all model setup, model input, and simulation output files generated in this project on a memory stick or external hard drive. Due 8 weeks after completion of Deliverable 3.B

Task 5. Secure publishing rights for page fees and open access fees for 2 manuscripts completed under this Work Assignment.

Two manuscripts completed under this WA will be published in peer reviewed scientific journals, (1) Potential effects of climate change on urban stormwater management using GI, and (2) Mapping RHESSys simulation results for urban archetypes to selected U.S. cities. The Contractor shall pay the publisher of each manuscript publication page fees and fees for open access for each of these manuscripts.

V. Schedule of Milestones and Deliverables:

TASK	DELIVERABLE	SCHEDULE
1	1.2.A. Progress reports	Due monthly
1	1.2.B. Other communication	Due upon request by the COR
1	1.3.A. QAPP	Due 2 weeks after award
2	2.A. Final – Sensitivity manuscript	Due 4 weeks after receiving comments from COR on the draft manuscript
3	3.A. Draft - Mapping manuscript	Due 8 weeks after Deliverable 2.A
3	3.B. Final – Mapping manuscript	Due 4 weeks after receiving comments from COR on Deliverable 3.A

4	4.A. Provide model files on hard drive	Due 8 weeks after Deliverable 3.B

VI. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

VII. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

VIII. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on subsequent deliverables.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WACOR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WACOR within four working days of verbal issuance. This will be forwarded to the CL-COR and CO for

their information and necessary actions.

The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Performance Work Statment, as well as comments and approval of reports and other deliverables

XI. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the CL-COR and the Contract Specialist or Contract Officer.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Phase 3 Climate Change Urban G

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e, 2i

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 09/29/2016

Comments:
Full Title: Phase 3 Climate Change Urban Green Infrastructure

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 09/30/2012 To 09/29/2016	$0.00	0
This Action:	$86,577.00	855
Total:	$86,577.00	855

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 10/15/2015	$86,577.00	855
Cumulative Approved:	$86,577.00	855

Work Assignment Manager Name: Thomas Johnson	(Signature)	(Date)	Branch/Mail Code: Phone Number: 703-347-8618 FAX Number:
Project Officer Name: Ruth Corn	(Signature)	(Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name	(Signature)	(Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley	Mark Cranley (Signature)	10/27/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Phase 3 Climate Change on WQ &

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e, 2i, 2L

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 09/29/2016

Comments:
Full Title: Phase 3 Climate Change on WQ & Aquatic Ecosystems

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2016		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Thomas Johnson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8618 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/25/15 (Date)	Branch/Mail Code: CPOL Phone Number: 513-487-2351 FAX Number: 513-487-2109

Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 3-15

I. Title: Phase 3 Synthesis and Assessment of Climate Change Effects on Water Quality and Aquatic Ecosystems

EAS Short Title: Phase 3 Climate change on WQ & Aquatic Ecosystems

II. Period of Performance: Award through September 29, 2016 (Contract OY-3)

III. Work Assignment Manager:
Thomas Johnson, PhD
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8618 (phone)
703-347-8694 (fax)
johnson.thomas@epa.gov

Alternate COR:
Britta Bierwagen, PhD
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Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8613
bierwagen.britta@epa.gov

IV. Introduction:

The EPA Office of Research and Development (ORD) Global Change Assessment Staff (GCAS) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCAS Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

EPA ORD GCAS is developing a national-scale synthesis and assessment of climate change effects on water quality and aquatic ecosystems, with particular focus on relevance and implications for EPA's National Water Program. The assessment will be developed as a set of inter-related modules including Science Syntheses (draft topics listed below) and Program Link documents (draft topics identified below)

embedded within an underlying, web-based organizational structure. The assessment will be co-developed with input from OW and the Regions and focus on relevance and implications for EPA's National Water Program (NWP). The assessment will also help to identify knowledge gaps and priority research needs necessary to advance the science in support of EPA adaptation and decision making.

Previous work under this Contract (WA 2-15) resulted in completion of:

- 10 draft "Science Syntheses" documents
- 10 draft outlines for "Program Link" documents
- Draft conceptual web design for the water quality assessment

This Work Assignment is for continuing support during Option Year 3 to complete final draft science syntheses and program link documents, to assist with development of a final web site structure, and to provide support to EPA to develop and post on an EPA web site a completed, web-based synthesis and assessment of climate change effects on water quality and aquatic ecosystems by Sept. 29, 2016.

V. Specific Tasks and Deliverables:

Task 1 – Prepare Workplan, Establish Communication, and Prepare QAPP

SubTask 1.1. Prepare Work Plan and Cost Estimate

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment.

SubTask 1.2. Establish communication with the COR and develop a regular reporting schedule

The Contractor shall contact the COR and schedule a kickoff project meeting. In collaboration with the COR the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.2.A: Brief, written progress reports as email to the COR. Due monthly or upon request by the COR for the duration of this Work Assignment.

Deliverable 1.2.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the COR for the duration of this Work Assignment.

SubTask 1.3. Develop a QAPP

All work conducted under this Work Assignment shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP). The contractor shall develop a Quality Assurance Project Plan within 30 days after project start for review and approval by the COR and the EPA QA Officer. The QAPP can be based directly on the previously approved QAPP developed for WA 2-15 in Option Year 2 titled "Synthesis and Assessment of Climate Change Effects on Water Quality and Aquatic Ecosystems". The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard

of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Work Assignment relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Work Assignment relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Work Assignment. The Contractor shall not perform any work under this work assignment until the above documents are reviewed and approved by the COR and Quality Assurance Manager (QAM).

Deliverable 1.3.A: QAPP for this WA. Due to the COR 2 weeks after award.

Task 2 – Revise 10 draft Science Synthesis reports to address EPA and other peer review comments, complete final drafts of each report for posting on the web, and provide electronic copies of each reference cited

Previous work under this Contract (WA 2-15) resulted in completion of 10 draft "Science Synthesis" reports addressing the following topics:

1. Streamflow
2. Nutrients (e.g., Nitrogen, Phosphorus)
3. Water Temperature
4. Pathogens/HABs/Invasive Species
5. Biota/Ecological Condition
6. Sediments
7. Sea level rise and salinity
8. Methods and Frameworks for Assessing Vulnerability and Adaptation
9. Working with Scenarios Adaptation for Infrastructure
10. Options for Adaptation

The Contractor shall, in consultation with the COR, revise the 10 draft Science Synthesis documents to address EPA and other peer review comments, and prepare complete final drafts of each document in a format specified by the COR and suitable for posting on the web. After completing the 10 final draft Science Synthesis documents, the Contractor shall provide electronic copies of each reference cited in all 10 documents. The Contractor shall also request and acquire any necessary permissions for inclusion of copyrighted or otherwise published figures and tables in the finished documents. The Contractor shall not pay a fee for use of copyrighted figures and tables without prior approval by the COR.

Each of the 10 Science Synthesis documents shall undergo 2 levels of peer review managed by EPA. Peer review of each Science Synthesis document will include internal review by EPA staff (internal), and external or outside review by 3rd party technical experts arranged by EPA and managed by the COR. Upon completion of peer review, the COR will provide comments on each document to the Contractor. Upon receiving comments, the Contractor shall revise each Science Synthesis document to address all internal and external peer review comments. The contractor shall also prepare a concise summary of

how they responded to each external review comment in a format specified by the COR (a disposition of comments sheet).

The final Science Syntheses documents shall be written in a format to be specified by the COR (e.g., ready to be incorporated into the web-based structure), and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall, in consultation with the COR, first propose a schedule for completing final versions of each Science Synthesis and submit to the COR for approval. The Contractor shall then revise the 10 draft Science Syntheses documents to address all COR, internal and external peer review comments, and submit final drafts of each report to the COR for approval. Upon approval by the COR, the Contractor shall provide electronic copies of each reference cited in all of the Science Syntheses documents.

Deliverable 2.A: Proposed schedule for completing final drafts of the 10 Science Synthesis documents. Due to the COR 8 weeks after award.

Deliverable 2.B: Final drafts of the 10 draft Science Synthesis documents that address all COR and internal and external peer review comments on the draft reports. Due to the COR as specified in Deliverable 2.A.

Deliverable 2.C: Disposition of external peer review comments received on each of the 10 Science Synthesis documents. Due to the COR at the same time as Deliverable 2.B.

Deliverable 2.D: Support upon request by the COR to develop journal article(s) for publication in a peer reviewed journal. Due to the COR as requested.

Deliverable 2.E: Electronic copies of each reference cited in all of the 10 Science Synthesis documents. Due to the COR at the same time as Deliverable 2.B.

Task 3 – Revise "Program Link" reports to address EPA Program Office and Regional comments

Previous work under this Contract (WA 2-15) resulted in completion of draft outlines for 10 "Program Link" documents addressing the following topics:

1. Water-Energy-Infrastructure Nexus (Water and Wastewater treatment, flooding/inundation)
2. Stormwater (CSOs, SSOs and GI)
3. Permitting (NPDES-including cooling water) and Wastewater (discharge)
4. Drinking Water (Source protection and treatment)
5. Monitoring and Bioassessment (Monitoring tools and programs)
6. Watershed Protection and Restoration (Healthy Watersheds, NPS control)
7. TMDL (TMDL, Water Quality Modeling, riverine loads including loads to estuaries)
8. Wetlands (inland and coastal; 404)
9. Water Quality Standards (Designated Uses, Criteria, and Anti-degradation)
10. Vulnerable Populations/Tribes (drinking water/fish consumption for rural/urban/suburban/tribal communities)

Each Program Link document will be 3-5 page summaries that links EPA program needs (drawn from the OW and Regional focus group meetings conducted by EPA during summer 2015) to the relevant science information. It will be important that these are reviewed and vetted by OW and the Regions to ensure they faithfully capture OW and Regional needs for information.

The Contractor shall, in consultation with the COR, develop the 10 draft "Program Link" documents to include a concise, technical synthesis of scientific understanding of priority climate, hydrologic and water quality changes of concern to each Program Link program/audience. A listing of priority climate change, hydrologic and water quality changes of concern to each program/audience will be provided to the Contractor by the COR. Technical information included in Program Link documents will be based on information contained in the longer and more detailed Science Syntheses documents. The Contractor will also revise Program Link documents to address any general comments and suggestions from EPA Program Offices and Regions (i.e., the target audiences for Program Links). Program Link revisions will be completed leading to the completion of final drafts of each Program Link document in a format specified by the COR and suitable for posting on the web.

The final draft Program Links shall be written in a format to be specified by the COR (e.g., ready to be incorporated into the web-based structure), and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall, in Consultation with the COR, propose a schedule for completing final versions of each Program Link document and submit to the COR for approval. Review and vetting of Program Link reports by EPA Program Offices and Regions will be managed by the COR. Upon completion of reviews, the COR will provide comments on each Program Link report to the Contractor. Upon receiving comments from the COR, the Contractor shall revise each draft Program Link report to address EPA Program Office and Region comments and submit to the COR for review.

> *Deliverable 3.A:* Proposed schedule for completing final drafts of the 10 Program Link documents. Due to the COR 8 weeks after award.
>
> *Deliverable 3.B:* Final drafts of the 10 Program Link documents that address all COR and EPA Program Office and Region comments. Due to the COR as specified in Deliverable 3.A.

Task 4 – Support to design and evaluate the usability of the WQA web-site, and to develop plain language web text as required

The WQA will be a web-based product with Science Syntheses and Program Link documents with plain language web text as an EPA website. This website will be developed and managed by the EPA. The Contractor shall review and provide guidance on EPA's proposed conceptual design of the web site upon request by the COR. The contractor shall also develop text for posting on the web site upon request by the COR.

Navigating the WQA EPA website will require intuitive and transparent links that users can easily follow to the desired information. EPA will work with EPA partners to review and test the usability of the web product. The review will consist of written reviews and a day-long meeting with 15-20 EPA Program Office and Regional staff to test usability. The Contractor shall facilitate the meeting to beta-test the usability of the WQA EPA website. The meeting will be held at EPA Potomac Yard in Crystal City, VA with

a webinar link for outside participants, in the winter/spring 2016 timeframe. The Contractor shall attend the meeting, take notes, and provide a brief summary report on the meeting outcomes.

Deliverable 4.A: Write plain language web text for posting on the WQA EPA website. Due as agreed upon with the COR.

Deliverable 4.B. Summary of outcomes of the site usability assessment meeting. Due 2 weeks after the meeting.

Task 5 – General Support in Developing Presentation and Outreach Materials

The Contractor shall provide miscellaneous support to develop the WQA. The contractor shall develop general presentation material that can be used in briefings and presentations related to the WQA including conceptual models, graphics, and text. Throughout the course of developing the WQA, multiple briefings will be given to EPA OW and the Regions. EPA will take the lead in developing the presentation material and will give the briefings and presentations. The contractor shall support the COR as requested to develop, review, and comment on presentation materials.

Deliverable 5.A: Presentation materials as requested by the COR. Due as agreed upon with the COR.

VI. Schedule of Milestones and Deliverables:

Task No.	DELIVERABLE	Schedule
1	1.2.A. Progress reports	Due monthly
1	1.2.B. Other communication	Due upon request by the COR
1	1.3.A. Work Assignment QAPP	Due 2 weeks after award
2	2.A. Schedule for final Science Syntheses (10)	Due 8 weeks after award
2	2.B. Final Science Syntheses reports (10)	Due as specified in Deliverable 2.A.
2	2.C. Disposition of comments forms (10)	Due at same time as Deliverable 2.B
2	2.D. Support to COR for journal article(s)	Due as agreed upon with the COR
2	2.E. Electronic pdf copies of all cited literature	Due at same time as Deliverable 2.B
3	3.A. Schedule for final Prog Link documents (10)	Due 8 weeks after award
3	3.B. Final Program Link documents (10)	Due as specified in Deliverable 3.A
4	4.A. Plain language web text	Due as agreed upon with the COR
4	4.B. Notes from site usability assessment	Due 2 weeks after the meeting
5	5.A. Presentation materials	Due as agreed upon with the COR

VII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

VIII. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

IX. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on subsequent deliverables.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The COR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the COR within four working days of verbal issuance. This will be forwarded to the CL-COR and CO for their information and necessary actions.

The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Performance Work Statement, as well as comments and approval of reports and other deliverables

X. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the CL-COR and the Contract Specialist or Contract Officer.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2016 Base Option Period Number 3	Phase 3 Climate Change on WQ &

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW: 2e, 2i, 2L

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2015 To 09/29/2016

Comments:
Full Title: Phase 3 Climate Change on WQ & Aquatic Ecosystems

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 09/30/2012 To 09/29/2016	$0.00	0
This Action:	$289,135.00	2,567
Total:	$289,135.00	2,567

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 10/15/2015	Cost/Fee: $289,135.00	LOE: 2,567
Cumulative Approved:	Cost/Fee: $289,135.00	LOE: 2,567

Work Assignment Manager Name: Thomas Johnson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8618 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 10/27/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109